

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

- Q Laser rangefinding
- Q The role of the attack helicopter
- Q Cruise missiles
- Q Counter-terrorist operations
- Q Animal subterfuge
- Q Urban conflict techniques
- Q Creating fake strategic targets



The Wheelbarrow MK. 7 EOD

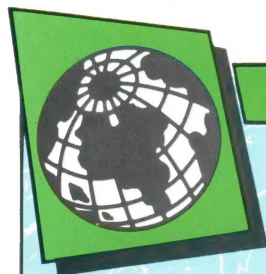


WARFARE

40

QUEST

CONTENTS 40



PLANET EARTH

URBAN COMBAT

153-154

Mouseholing - cleaning a corridor - close-quarter fighting - dealing with snipers - strengthening strongpoints - appropriate weapons siting

DECEPTION TECHNIQUES

155-158

Hiding ships - dummies and decoys - inflatable bridges - smoke grenades - fake heat sources - anti-radar nets - toned down landmarks

THE LIVING WORLD

SURVIVAL STRATEGY

159-162

Undersea camouflage - predatory insects - mimicking surroundings - poisonous animals - playing possum - the chaffinch's flight path



NEW TECHNOLOGY

COUNTER TERRORISM

271-274

Advanced surveillance equipment - electronic 'sniffers' - internal security vehicles - the 'wheelbarrow' - body armour - sniper detection system

BOMBS AWAY!

275-278

Counter-insurgency operations - heavy bombers - reconnaissance duties - terrain-following radar - stand-off capability - air-launched cruise missiles

GUNSHIPS

279-280

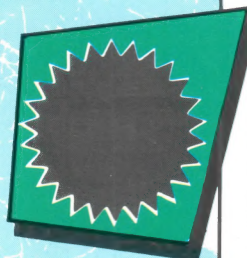
Offensive missile systems - miniguns - automatic targeting - Hellfire rockets - Apache's avionics - thermal imaging equipment - the Soviet helicopter/killer

ENERGY AND RESOURCES

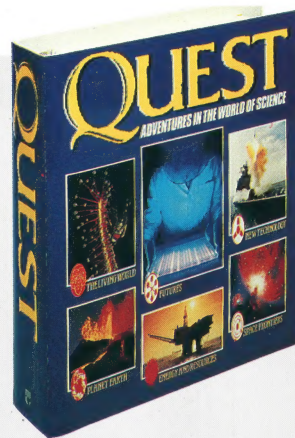
BEAMS IN BATTLE

127-128

Laser target markers - 'smart' shells - tracer rounds - range finding - laser 'blinding' weapons - death rays for global defence



Pack cover: Apache AH-64 attack helicopter; US marine camouflaged for beach landing; Lebanese soldier fighting in Beirut. **Fact file cover:** Loading a B66 thermo-nuclear bomb on to an FB111 bomber; illustration of the 'wheelbarrow', remote bomb disposal device.



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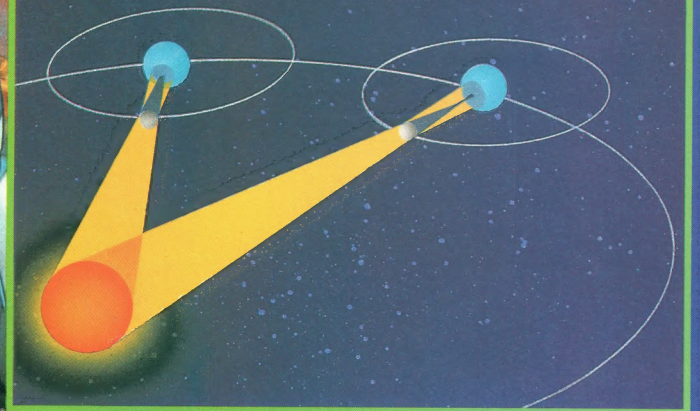
SOUTH AFRICA & MALTA: Back numbers are available through your newsagent.

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ADVENTURES IN THE WORLD OF SCIENCE

- Q Putting the sparks in fireworks
- Q Beaming live action into your home
- Q The scene backstage
- Q Solar and lunar eclipses
- Q How a planetarium projector works
- Q Cartoon films

Solar Eclipses



- Q Special photographic effects

ENTERTAINMENT

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PLANET EARTH

GREATEST SHOWS ON EARTH

159-160

Causes of the polar lights – predicting solar eclipses – meteor showers – shooting stars – exploding meteorites – river bores – volcanoes on Mars

FIREWORKS!

161-162

Gunpowder – rockets – Catherine wheels – adding sparks and glitter – creating colours – putting the bang in bangers – setting up a big display

THE LIVING WORLD

OCEAN WORLDS

163-164

Building a dolphinarium – replicating sea water – monitoring salinity – preventing corrosion – filtering and cleaning systems



NEW TECHNOLOGY

DRAWING POWER

281-284

Storyboards – laying down the sound track – synchronizing motion and sound effects – the computer-operated camera – panning and zooming effects

OUTSIDE BROADCAST

285-288

Gigantic scanners – monitor banks – the mobile control room – television cameras – the production crew – transmission links – gun microphones – action replays

BACKSTAGE

289-292

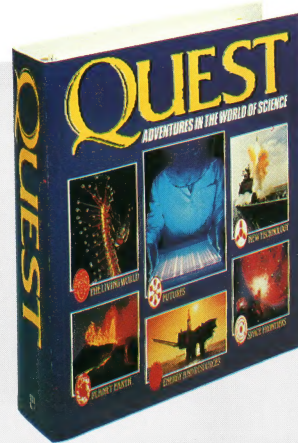
Floating scenery on air cushions – software programs – lighting techniques – versatile lanterns – matchstick-sized microphones – sound equalizing systems

SPACE FRONTIERS

STAR GAZING

45-46

Planetarium projectors – moveable globes – simulating the movement of constellations – new electronic projection systems



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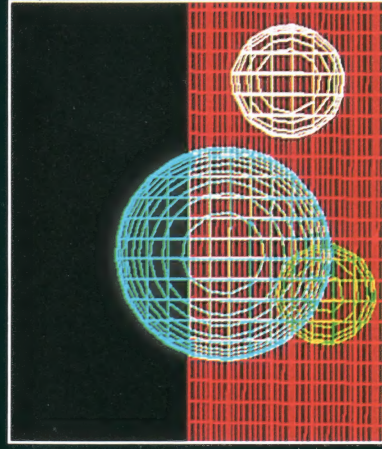
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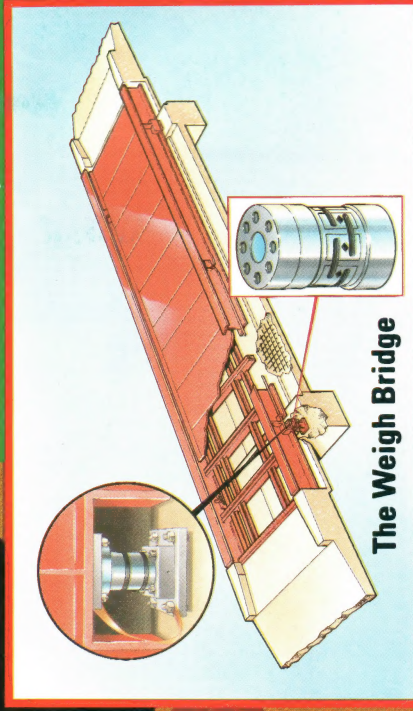
A Marshall Cavendish Discovery Collection

QUEST

ADVENTURES IN THE WORLD OF SCIENCE



- Q Patterns in nature
- Q Orienteering
- Q The search for hidden dimensions
- Q Weights and measures
- Q 'Rubber sheet geometry'
- Q Surveying systems
- Q The 'Butterfly Effect'



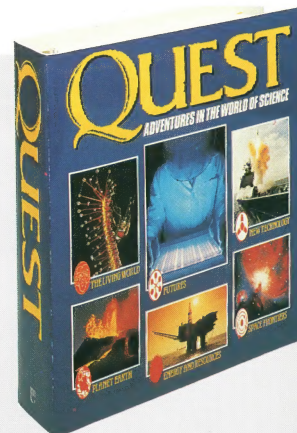
The Weigh Bridge

SCIENCE OF NUMBERS

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QUEST

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PLANET EARTH

MAP-MAKING

163-166

Different 'projections' - distortions - topology - surveying systems - relief maps - contour lines - longitude and latitude

PATTERNS OF CHAOS

167-170

Deterministic laws - population theories - branching shapes in nature - fractal curves - chaos within the human body

THE LIVING WORLD

THE NUMBERS GAME

165-166

Betting systems - limiting the stakes - laws of chance - setting the odds - throwing the dice - games of skill - random numbers

SHAPES IN NATURE

167-170

Fibonacci's numbers - rotational and reflectional symmetry - spiral galaxies and shells - the Golden Rectangle

NEW TECHNOLOGY

WEIGHTS AND MEASURES

293-296

'Smart' tools - high-tech spirit levels - digital rulers - electronic tape measures and scales - weighbridges - strain gauges - international units of measurement

SPACE FRONTIERS

HIDDEN DIMENSIONS

47-48

Height - width - depth - living in a one-dimensional world - two-dimensional beings - time: the fourth dimension - the universe 'next door'

FUTURES

ELECTRONIC ART

107-108

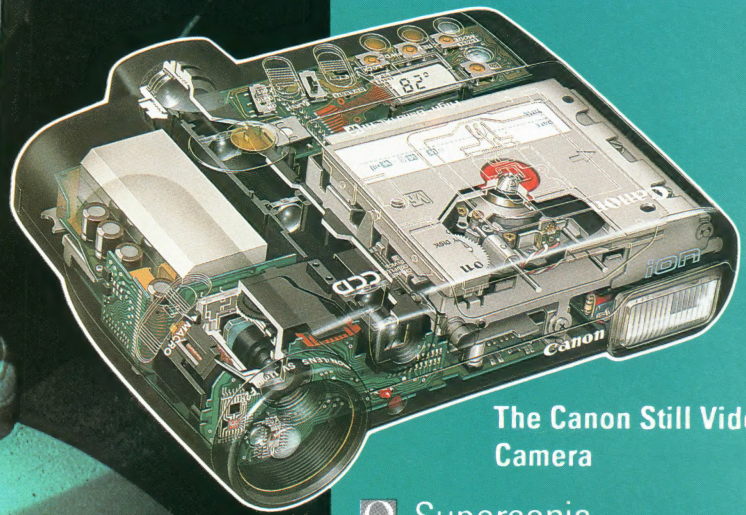
Computer 'sculptures' based on maths - distorting basic shapes - 'wireframe' images - 3-D pictures

Pack cover: Fractal geometry as seen on a VDU screen (main image); spiral-shaped shell (inset left); geologists using a theodolite and computer generated images of dice. **Fact file cover:** a 3-D computer image created by artist William Latham; diagram of a weighbridge.

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

- Q In-car navigation systems
- Q Japan's experimental Maglev train
- Q Travelling to the edge of Space
- Q Penicillin – the first antibiotic drug
- Q Four-wheel steering



The Canon Still Video Camera

- Q Supersonic combustion ramjets
- Q Batteries – portable power packs
- Q Modern use of microwaves
- Q Tomorrow's television systems

INVENTIONS

43

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THE LIVING WORLD

WONDER DRUGS

171-172

Fighting bacteria – antibiotics – their shapes and structure – penicillin – destroying germs – bursting cell walls – side effects – synthetic strains – allergic reactions

NEW TECHNOLOGY

CAMCORDERS

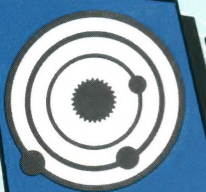
297-298

VCRs – remote-control units – magnetic pulses – sound signals – tuning into channels – editing features

SMART SETS

299-300

High-definition TV – sharper pictures – wider screens – screen scanning – higher frequency signals – digitized pictures



SPACE FRONTIERS

SPACE PLANES

49-52

Turbojet engines – ramjets – supersonic combustion – cooling systems – two-stage craft – motherships – launch vehicles

FUTURES

CONCEPT CARS

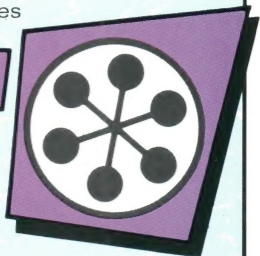
109-112

Aerodynamic shapes – automatic warning devices – noise cancellation – the dashboard computer – navigation satellites

MAGLEV TRAINS

113-114

Electrodynamic suspension – magnetic 'wheels' – superconduction – the linear induction motor



ENERGY AND RESOURCES

POWER PACKS

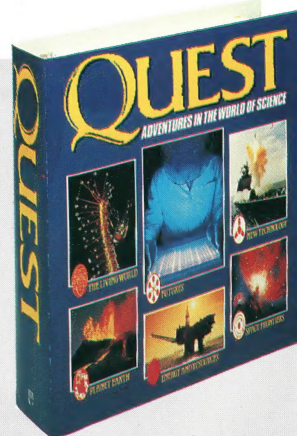
129-130

Batteries – cells – ions – the electrolyte – collection points – terminals – circuits – voltage – recharging units

MICROWAVES

131-134

Electrical energy – Earth stations – communication networks – computer links – radar – masers – high speed cookers



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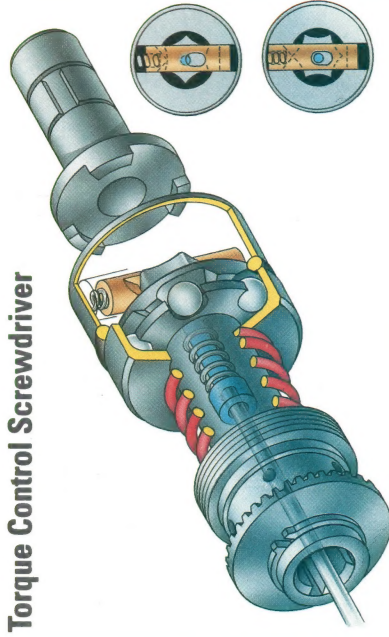
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QUEST

ADVENTURES IN THE WORLD OF SCIENCE

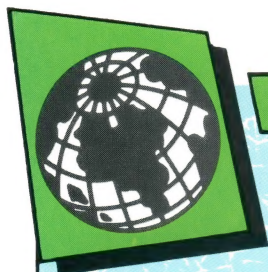
- ☐ Combine harvesters
- ☐ Building roads and digging tunnels
- ☐ Pneumatic wrenches
- ☐ Preparing a dental cavity
- ☐ Fusing vertebrae
- ☐ Plastic and reconstruction surgery
- ☐ Robot Space tug
- ☐ Remote inspection vehicles

Torque Control Screwdriver



QUEST

CONTENTS 44



PLANET EARTH

SPEEDING THE PLOUGH

171-174

Air-conditioned tractor cabs – shuttle transmission – computerized monitoring – rotating-disc ploughs – extendible 'dibbers'

BIG DIGGERS

175-178

Giant rippers – harvesters – articulated arms – backhoe loaders – compressed nitrogen suspension – compacters – paving train – laser theodolite – tungsten carbide picks

NEW TECHNOLOGY

HAND POWER

301-302

Hammer action drills – 'torque control' – electric screwdrivers – tungsten carbide blades – alligator-type saw – vacuum cleaning system – steam stripper

DRILLS 'N' FRILLS

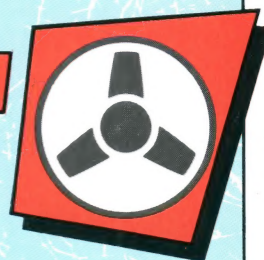
303-304

Air turbine drill – interchangeable handpieces – burs – dental amalgam – cartridge syringe – dental chairs – cuspidor – fibre optic light guide – ultrasonic scaler

NEW SHARPS

305-308

Sprung forceps – surgical microscope – titanium needle holder – flexible viewing instrument – 'keyhole' surgery



SPACE FRONTIERS

ASTRO NUTS AND BOLTS

53-54

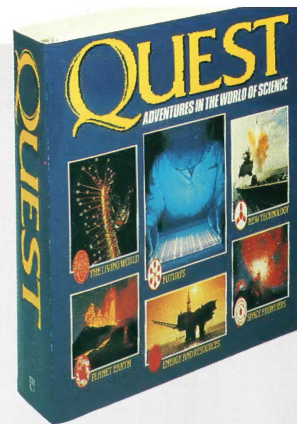
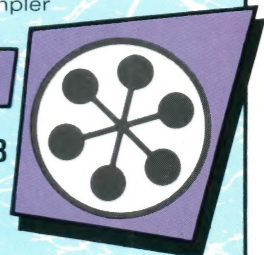
Manned Manoeuvring Unit – Shuttle robot arm – foot restraints – anti-torque tools – multi-purpose power tool – core sampler

FUTURES

THE CUTTING EDGE

115-118

Profile milling machine – five-axis cutting head – vacuum holding unit – direct numerical control – computer-aided design – computer-integrated manufacture



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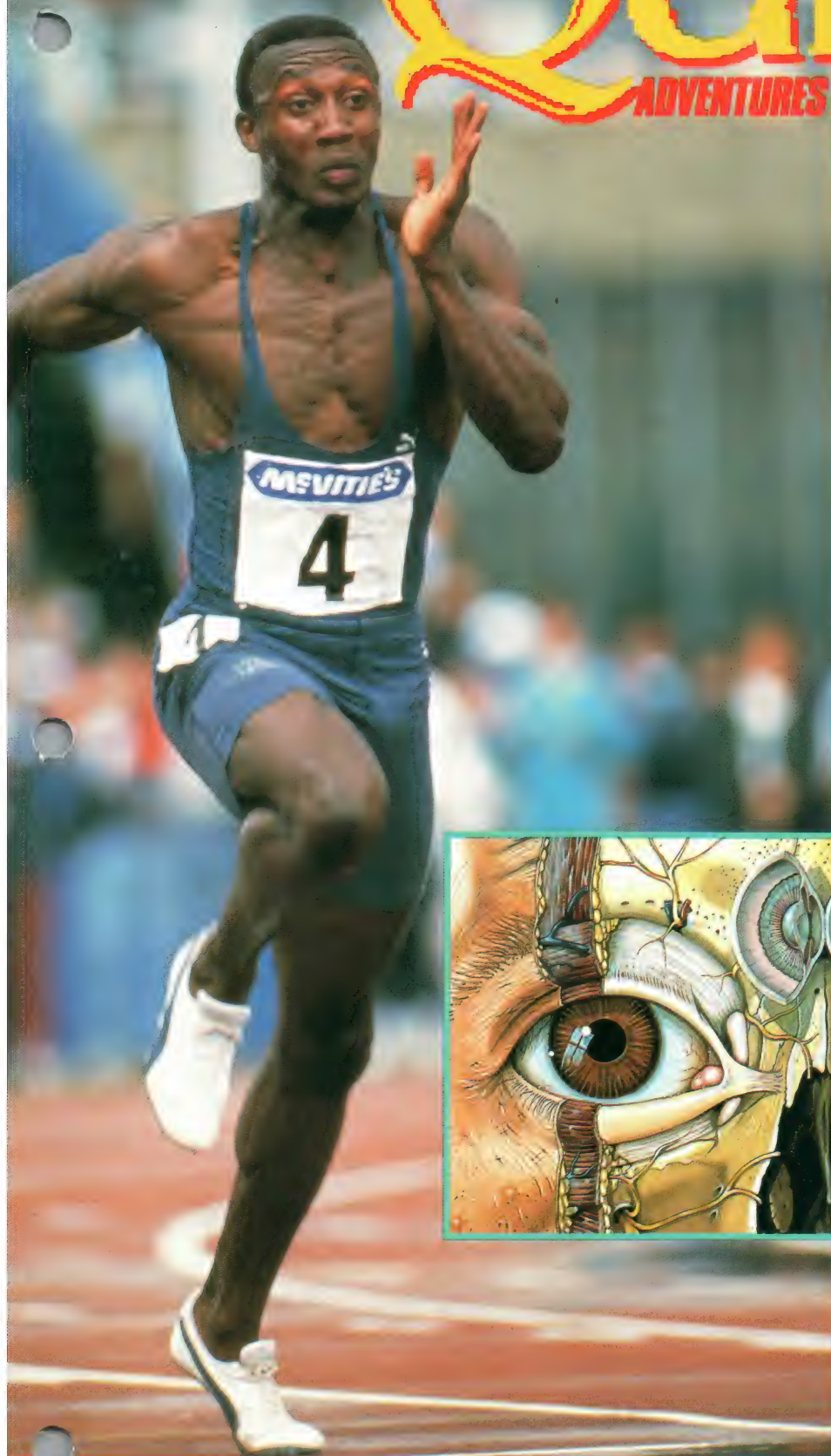
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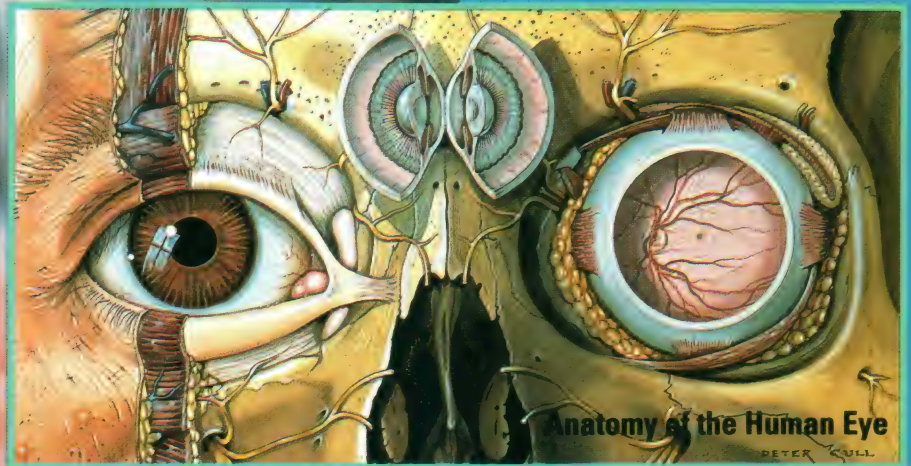
Pack cover: Astronaut Bruce McCandless performs maintenance work in the cargo hold of the US Shuttle Challenger (main image); a compressed-air grinding tool in use; a touch-sensitive dental tool console. **Fact file cover:** A giant ripper, used for breaking up hard ground; a torque-control screwdriver.

QUEST

ADVENTURES IN THE WORLD OF SCIENCE



- Q Air and water currents
- Q Muscles of the body
- Q Testing cars, boats and planes
- Q Industrial explosives and bombs
- Q Profile of the Sun
- Q Electricity in nature



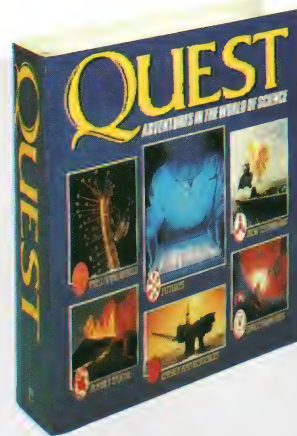
- Q Magnets in technology

FORCES

45

QUEST

CONTENTS 45



PLANET EARTH

THE COMMANDING CURRENTS 179-180

Global air circulation – the trade winds – the doldrums – continental land masses – the Sargasso Sea – whirlpools – waterspouts

THE LIVING WORLD

MUSCLE POWER 173-176

Skeletal muscle – visceral muscle – intercalated disc – fast and slow twitch – force amplification – contractile mechanism



NEW TECHNOLOGY

DESTRUCTION TESTING 309-310

Vehicle test track – sidewind generator – impact-measuring device – test dummies – wind tunnel tests – sea trials – test pilots

EXPLOSIONS 311-312

Shock wave – rapid burning – chemical reaction – nitroglycerine – dynamite – plastic explosives – nuclear weapons



SPACE FRONTIERS

THE MIGHTY SUN 55-58

Crushed atoms – energy generation – convection – sunspots – trapped magnetic fields – prominences – corona – solar wind



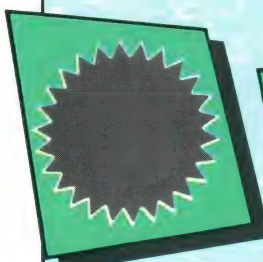
FUTURES

LIVING VOLTS 135-138

Thunderstorms – static electricity – invisible discharge – ionized air – ball lightning – nerve cell impulses – electroreceptors

NATURAL ATTRACTION 139-142

Magnetite – magnetic poles – lines of force – electromagnetism – atom smashers – magnetic recording – EMP – gamma rays



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Pack cover: Kirlian photograph of a steel ball being dropped into a high-energy electrical field (main image); strongman pulling Concorde (inset right); a solar furnace (bottom). **Fact file cover:** sprinter Linford Christie; artwork of the human eyeball and eyesocket (inset right).

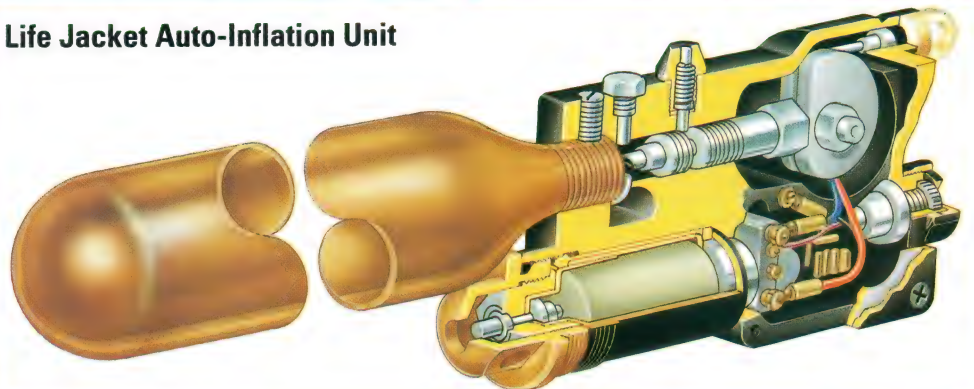
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- ❑ Technology in the emergency room
- ❑ The hazards of Space
- ❑ Making energy from garbage
- ❑ Surviving in the sea
- ❑ At the extremes of the Earth
- ❑ How animals adapt
- ❑ Ecosystems explained

Life Jacket Auto-Inflation Unit

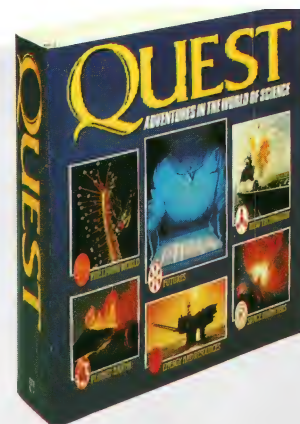


SURVIVAL

51

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PLANET EARTH

WORLDS WITHIN WORLDS

204-205

Green plants – carnivores – pitcher plants – the top predators – Lake Baikal – shrimp-like amphipod – zooplankton – Biosphere II

THE LIVING WORLD

STAYING ALIVE

193-196

Ocean depths – gulper eel – dehydrated tardigrades – life in polar regions – water-proof coats – regenerating limbs

NEW TECHNOLOGY

EMERGENCY

347-350

Ambulances – poisoning – EMIT – cardiopulmonary resuscitation – defibrillator – gastric lavage

TO THE ENDS OF THE EARTH

351-354

Polar survival – frostbite – thermal insulation clothing – polar tents – All Terrain Cycle – pressure ridges – radio transmission

THE CRUEL SEA

355-358

Shipwreck – hypothermia – HELP – exposure suits – personal flotation device – sea dye markers – emergency locator

SPACE FRONTIERS

HIGH RISKS

71-72

Charged particles – radiation sickness – solar storm shelters – brittle bones – white cell loss – Space sickness – movement

FUTURES

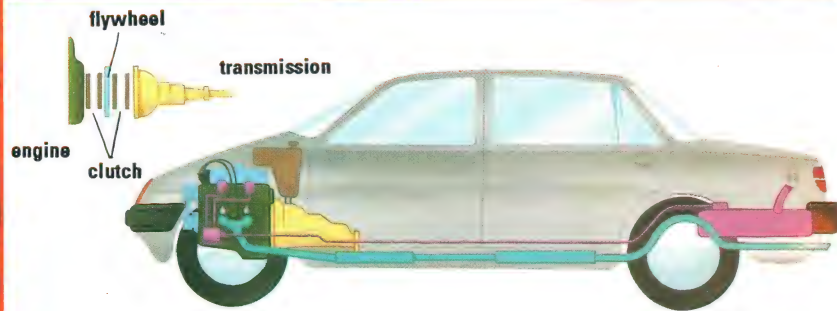
TRASH POWER

135-136

Waste power plants – pyrolysis – hydrogenation – refuse-derived fuel – biogas digestors – geothermal power

QUEST

ADVENTURES IN THE WORLD OF SCIENCE



Methanol-Driven Car

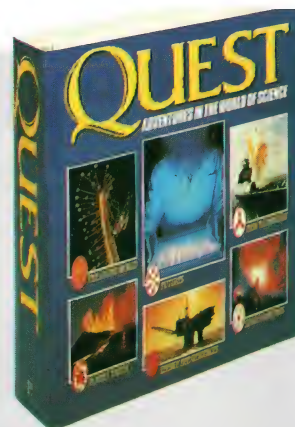
- ☐ How does food fuel the body?
- ☐ Power from the atom
- ☐ Generating electricity
- ☐ Digging coal from the ground
- ☐ How plants turn light into energy
- ☐ Fuels for the future
- ☐ The cutting edge of energy conservation
- ☐ Energy from Space

ENERGY

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QUEST

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THE LIVING WORLD

FUELLING THE BODY

187-190

Inside the body – enzymes – hydrochloric acid – the villi – nutrients – muscle pairs – the heart – motor cortex – energy in food

THE GREEN MACHINE

191-192

Sugar from light – photons – chloroplasts – stomata – spongy layer of cells – phloem tubes – artificial photosynthesis

NEW TECHNOLOGY

NUCLEAR POWER

343-346

Groups of particles – radioactive elements – nuclear reactor – fission – cylindrical fuel elements – control rods – breeder reactors



SPACE FRONTIERS

BEAMING IT BACK

67-68

Solar cell array – orbiting power stations – microwave link – ground station – solar-sail craft – interstellar light – antimatter rocket



FUTURES

NEW FUELS

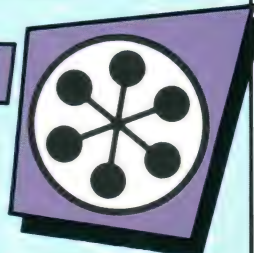
131-132

Ethanol – fermenting crops – hydrocarbons – methanol-adapted engines – natural gas – variable-fuel vehicle – wind-powered cars

SAVE IT!

133-134

Energy waste – combined heat and power plant – heat-resistant turbine blades – energy conservation – 'smart' materials



ENERGY AND RESOURCES

ELECTRICITY

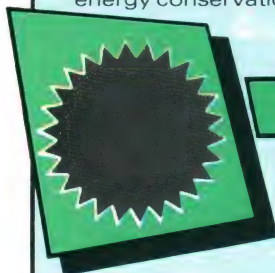
145-148

Negatively-charged particles – circuits – alternating current – power stations – superconductors – voltage difference

KING COAL

149-150

Hi-tech mines – electronic guides – power stations – high-pressure turbine – scrubbers – fluidized-bed combustion



Pack cover: Gymnast powered by contracting muscles (main image); electric spark discharged between two metal objects (inset top); molten nuclear waste glass (inset bottom).

Fact file cover: Technician in nuclear power plant (main image); methanol-driven car (inset).

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

Acid Rain



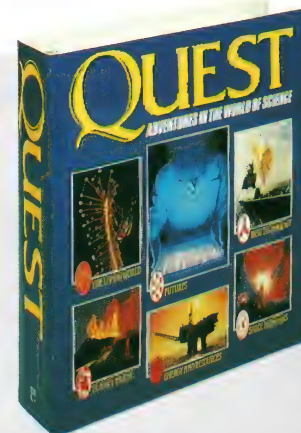
- Q What to do with piles of rubbish
- Q Saving endangered species
- Q How safe is breathing?
- Q The Earth as a living creature
- Q Nature fights back
- Q The problem with people

ENVIRONMENT

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QUEST

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PLANET EARTH

SOMETHING IN THE AIR

197-200

Smog – carbon monoxide – the hazards of breathing – acid rain – catalytic converters – the dangers of lead – hydrocarbons

THE LIVING PLANET

201-204

The Earth goddess Gaia – creatures that make rain – regulating the temperature – fixing the level of salt in the seas

THE LIVING WORLD

FACING EXTINCTION

183-184

The black tamarin – adelic penguins – puffins – blind river dolphins – rare plants – shark fin soup – ivory-billed woodpecker

NATURE FIGHTS BACK

185-186

Finding new habitats – recolonizing industrial sites – escaped animals – living on the motorways – new species

NEW TECHNOLOGY

GLOBAL GARBAGE CRISIS

341-342

Landfill – burning rubbish – energy recovery – recycling glass – paper reclamation – the persistence of plastic – the dangers to wildlife

SPACE FRONTIERS

SPACE JUNK

65-68

Tracking debris – dead satellites – damaged Space craft – avoiding collisions – Whipple bumpers – cosmic garbage collectors – shooting stars

FUTURES

THE BIG SQUEEZE

127-130

The population explosion – greying populations – mortality rates – contraception – overcrowding

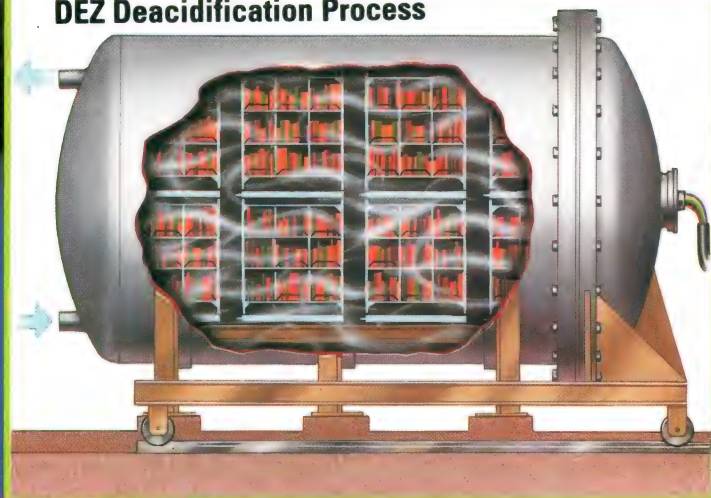
Pack cover: The Earth as seen from the Moon (main image); a car exhaust pipe belching pollution (left); a smog mask in use (inset right) **Fact file cover:** A polythene recycling plant; how acid rain affects the environment.

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

- ❑ Detecting fakes
- ❑ Art in nature
- ❑ The face of Mars
- ❑ Preserving priceless works of art
- ❑ Restoration and repair
- ❑ Detonographs

DEZ Deacidification Process

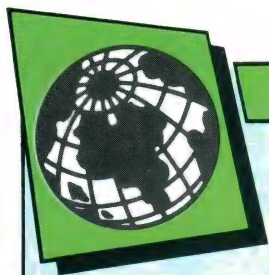


ART

48

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PLANET EARTH

FACE-LIFT

193-196

Infrared light – microscope examination – colour graphic display – parallel strips – humidity-controlled terrapins

THE LIVING WORLD

NATURAL BEAUTY

179-182

Birds of paradise – male peacocks – dart-poison frogs – heliconid butterflies – nectar guides – tiger lilies – colour for defence



NEW TECHNOLOGY

TRUE OR FALSE?

333-336

Infrared reflectography – digital video camera imaging – laser fluorescence spectroscopy – micrographs

WELL PRESERVED

337-340

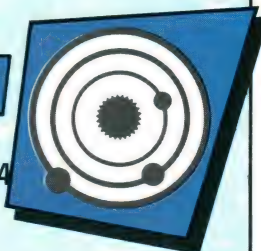
Damage by visitors – acid rain – preserving stone – air or water blasting – double-glazing – neutralizing acid in paper

SPACE FRONTIERS

OUT OF THIS WORLD

63-64

Pioneer 10 and 11 – the Pioneer plaques – coded information – messages for aliens – the Voyager probes – the giant Martian face

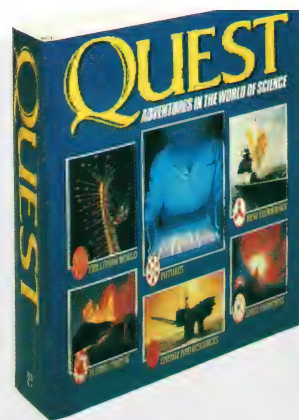
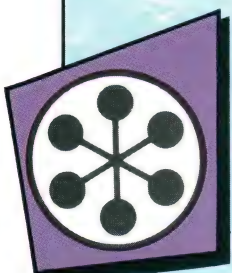


FUTURES

DIFFERENT STROKES

123-126

Kinetic art – explosive bas-reliefs – metallic foils – 6-metre-wide fireball – painting by computer – digitized data – 3-D imaging – electrochromic materials – holograms



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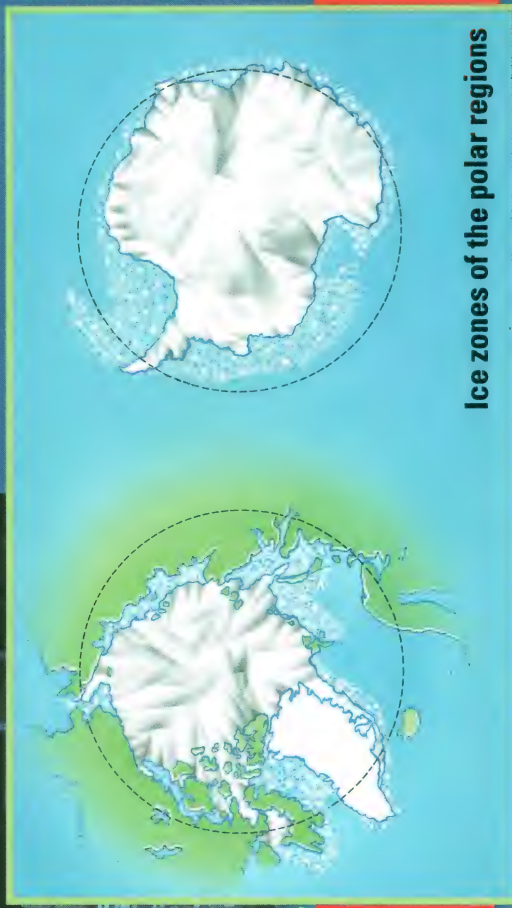
QUEST

ADVENTURES IN THE WORLD OF SCIENCE

- ❑ Offshore supertanker ports
- ❑ Hi-tech yacht construction
- ❑ Journey under the ice
- ❑ Coastal erosion
- ❑ The riches of the seabed
- ❑ Mega shipyards
- ❑ Strange seas on other planets



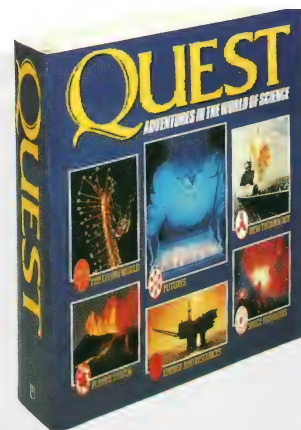
THE SEAS 47



Ice zones of the polar regions

QUEST

CONTENTS 47



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PLANET EARTH

COASTLINES

185-188

Rocky cliffs – dissolved chemicals – long-shore drift – projecting headlands – black sand – submarine bar – rockpools

ICY WATERS

189-192

Permanent ice pack – pancake ice – freezing blizzards – leads – pressure ridges – eskimos – phytoplankton – killer whales

NEW TECHNOLOGY

PORTS OF CALL

325-328

Metal containers – straddle carrier – mixed and bulk cargo – deep water channels – underwater storage tanks – LASH – ferries

SHIP SHAPE

329-332

Design – scale models – watertight bulkheads – hydraulic presses – prefabricated sections – dry docks

SPACE FRONTIERS

CELESTIAL SEAS

61-62

Water vapour – the greenhouse effect – underground frost – radioactive elements – liquid ammonia – terraforming

FUTURES

RACING YACHTS

121-122

Computer-aided design – winglets – hydrofoil – games theory – low-friction plastic-film – multihulls – proas – wingsails

ENERGY AND RESOURCES

ROCK BOTTOM

143-144

Sand and gravel – deposits of shells – metal-rich sands – seaweed – Pacific giant kelp – oysters and pearls – natural sponges

Pack cover: Pacific Coast, California, USA (main image); sea urchin (top right); 1989 Admiral's Cup (bottom right). **Fact file cover:** Container port, Singapore (main image); artwork of polar ice zones.



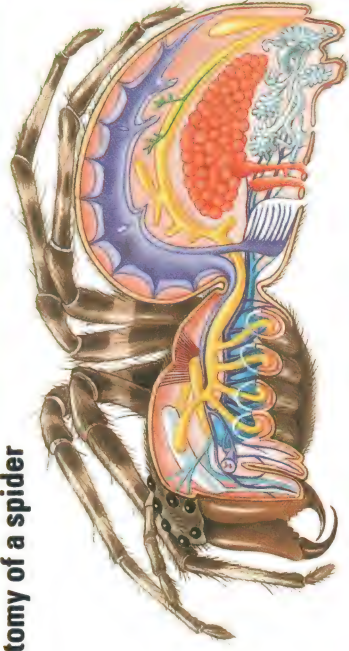
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QUEST

ADVENTURES IN THE WORLD OF SCIENCE

- Q Patterns in nature
- Q The animal constructors
- Q On the building site

Anatomy of a spider



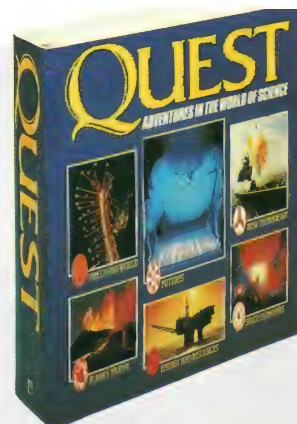
- Q Hi-tech demolition
- Q At the launch pad
- Q Buildings that think
- Q Laying and relaying roads

CONSTRUCTIONS II

46

QUEST

CONTENTS 46



PLANET EARTH

ON SITE

181-184

Draining the site – bore holes – the Master Programme – road and rail access – groundslab – scaffolding – steel frames

THE LIVING WORLD

HOME SPUN

177-178

Butterfly larvae – spinning cocoons – abdominal glands – silk filaments – 'capture' threads – orb-shaped webs

NEW TECHNOLOGY

PAVING THE WAY

313-316

Aggregate – 'macadam' – hot-rolled asphalt – explosive blasting – blast-furnace slag – planning the route – bulldozers – the subgrade – concrete train – 'blacktop'

THE CRUNCH BUNCH

317-320

Thermal reaction process – explosives – pulverizing jack-hammer – oxyacetylene torches – hydraulic shears – thermic lance – recycling – compressed-air hose

GIANT HANDS

321-324

The hoist – bridge cranes – the gantry – remote control – slewing – cantilevering arrangements – 'overturning moment' – grabs and buckets – telescopic arms

SPACE FRONTIERS

BLAST OFF

59-60

Mobile Launcher Platform – giant crawler transporter – Fixed Service Structure – Orbiter Access Arm – the 'white room'

FUTURES

BUILDINGS WITH BRAINS

119-120

Remote control – programmed heating system – home entertainment equipment – the integrated office – communications – heat sensors – voice controls

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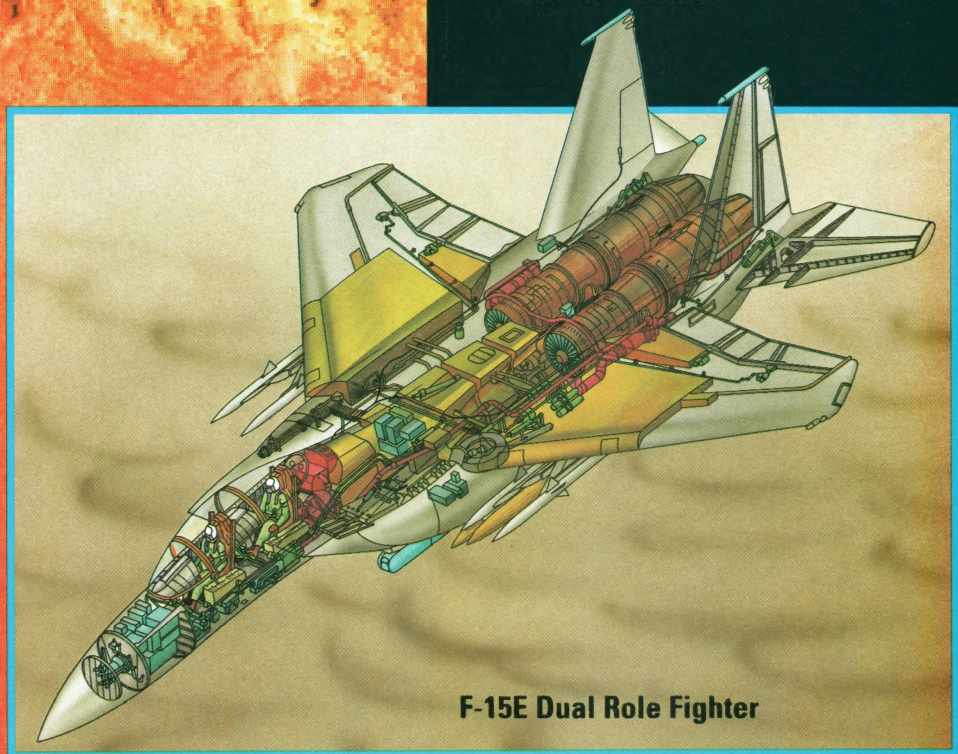
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- Q Arid wastelands on other planets
- Q Desert warfare
- Q The frozen continent
- Q Mining technology beneath the sands
- Q How land is lost to the desert
- Q The strange creatures of the barren lands



F-15E Dual Role Fighter

DESERTS

52

QUEST

CONTENTS 52



PLANET EARTH

SANDSCAPES

206-209

Hyperarid lands – high-pressure zones – sea-water currents – rain shadow – weathering and erosion – dunes

ICY WASTELAND

210-213

Southern Ocean – annual precipitation – ice sheets – mountain ranges – South Pole – Scott and Amundsen – factory ships

DUNE WARS

214-217

Sandstorms – heat illness – mobile armoured forces – artillery – navigation equipment – desert driving

THE LIVING WORLD

SOME LIKE IT HOT

197-200

Drinking the fog – camel's hump – cooling adaptations – cooling behaviour – storing water – giant saguaro cactus – bottle tree

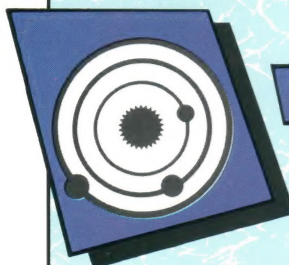


SPACE FRONTIERS

ARID WORLDS

73-74

Venus's atmosphere – Viking Lander 1 – Martian volcanoes – ultra-violet light – water-eroded channels – permafrost

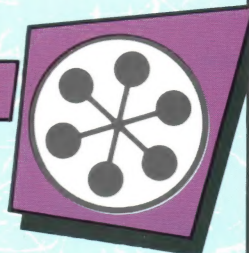


FUTURES

SHIFTING SANDS

137-138

Desertification – livestock grazing – water erosion – plate tectonics – clearing rainforests – poor drainage – plastic trees

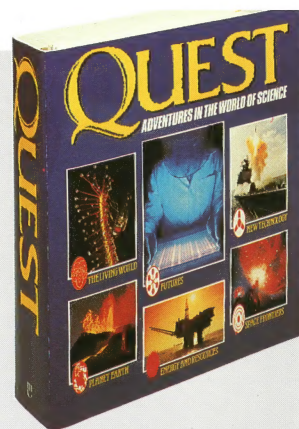
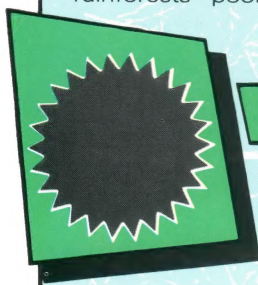


ENERGY AND RESOURCES

HIDDEN RICHES

151-152

Subsurface formations – satellite prospecting – seismic surveys – drilling for oil – precious materials – salt ponds



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QUEST

ADVENTURES IN THE WORLD OF SCIENCE

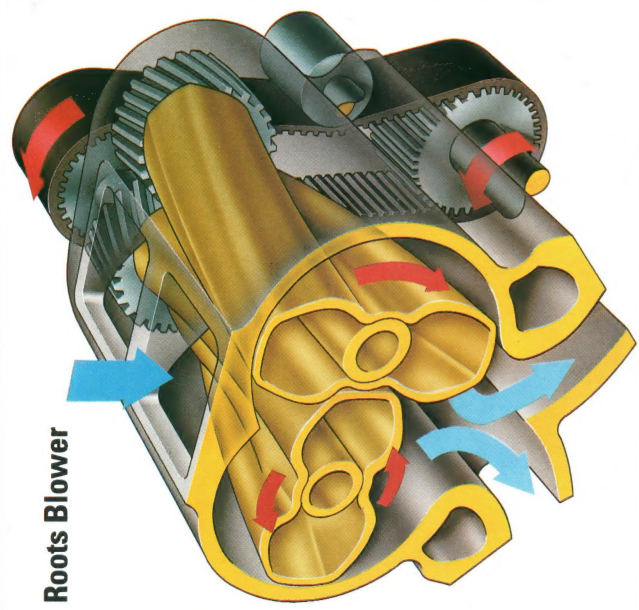


CHALLENGES

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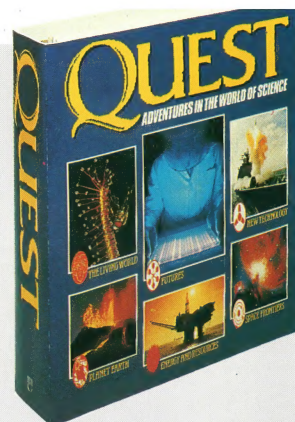
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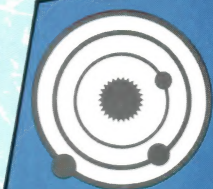


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Pack cover: A supercharged drag racing car leaves the line (main image); athlete Matthew Yates on a treadmill (bottom right); wing walker (bottom left). **Fact file cover:** The Crane brothers on mountain bikes at over 5,000 metres (main image); illustration of a supercharger (bottom right).